

Analyzing units of measure to decide how to convert from one unit to another is called dimensional analysis. For example, since $1 \text{ ft} = 12 \text{ in.}$ and $\frac{1 \text{ ft}}{12 \text{ in.}} = 1$, you can multiply by $\frac{1 \text{ ft}}{12 \text{ in.}}$ to convert from inches to feet. For unit conversion tables, see Lessons 1-4 and 4-8.

1 EXAMPLE Converting Units

Use dimensional analysis to convert 42 in. to feet.

$$42 \text{ in.} = \frac{42 \text{ in.}}{1} \cdot \frac{1 \text{ ft}}{12 \text{ in.}} \quad \leftarrow \text{Use a conversion factor that changes inches to feet.}$$

$$= \frac{\cancel{42} \text{ in.} \cdot 1 \text{ ft}}{\cancel{12} \text{ in.}} \quad \leftarrow \text{Divide the common units.}$$

$$= \frac{7}{2} \text{ ft} \quad \leftarrow \text{Simplify.}$$

$$= 3\frac{1}{2} \text{ ft} \quad \leftarrow \text{Write as a mixed number.}$$

2 EXAMPLE Finding the Better Buy

Shopping Brand A costs \$5.29 for 1 gal of cranberry juice. Brand B costs \$2.39 for 64 fl oz of cranberry juice. Which brand has the lower unit price?

Step 1 Convert units so both brands have the same unit of measure.

$$64 \text{ fl oz} = \frac{64 \text{ fl oz}}{1} \cdot \frac{1 \text{ gal}}{128 \text{ fl oz}} \quad \leftarrow \text{Use a conversion factor that changes fluid ounces to gallons.}$$

$$= \frac{64 \text{ fl } \cancel{\text{oz}} \cdot 1 \text{ gal}}{128 \text{ fl } \cancel{\text{oz}}} \quad \leftarrow \text{Divide the common units.}$$

$$= 0.5 \text{ gal} \quad \leftarrow \text{Simplify.}$$

Step 2 Find the unit price of each brand and compare.

$$\frac{\$5.29}{1 \text{ gal}} = \$5.29/\text{gal} \quad \leftarrow \text{Brand A}$$

$$\frac{\$2.39}{0.5 \text{ gal}} = \$4.78/\text{gal} \quad \leftarrow \text{Brand B}$$

Since $\$4.78 < \5.29 , Brand B has the lower unit price.

EXERCISES

Use dimensional analysis to make each conversion.

1. 10 qt to gallons
2. 38 cm to meters
3. 6 kg to grams
4. 1 mi to yards
5. 15 g to kilograms
6. 1,056 ft to miles
7. 137 oz to pounds
8. 24 fl oz to cups

Use dimensional analysis to determine which item has the lower unit price.

9. 8 ft for \$3.29 or 5 yd for \$6.62
10. 16 pt for \$52.87 or 3 gal for \$69.60
11. 27 g for \$16.20 or 1.2 kg for \$320
12. 5 lb for \$8.23 or 60 oz for \$7.15